Ion Power Absorption of the High Harmonic Fast Wave in NSTX

NSTX Research Forum

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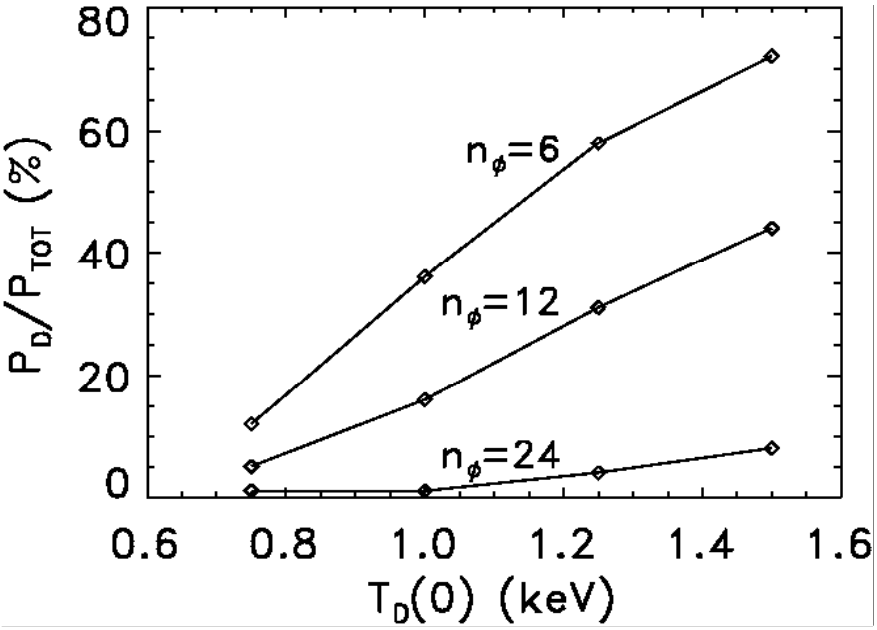
Thesis Goals

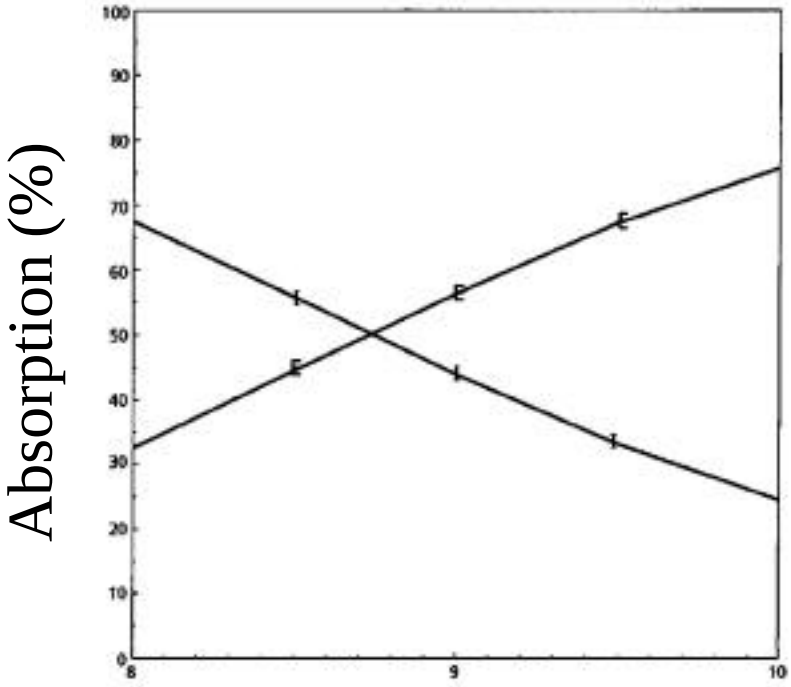
- Experimentally quantify ion absorption in NSTX
  - Compare to electron absorption
  - Possibly look at other STs
- Show dependence on various plasma and wave parameters
  - n_e, T_i, T_e, B_T, $k_{||}$
- Analyze NSTX shots with and without neutral beams, compare

Absorption vs. T_D, $k_{||}$



$T_e(0)$ = 1.5 keV
$n_e = 3.8\times10^{13}$ cm^{-3}
B_T = .3 T
f = 30 MHz
$\omega/\Omega_D \approx 16$

Menard, ’99

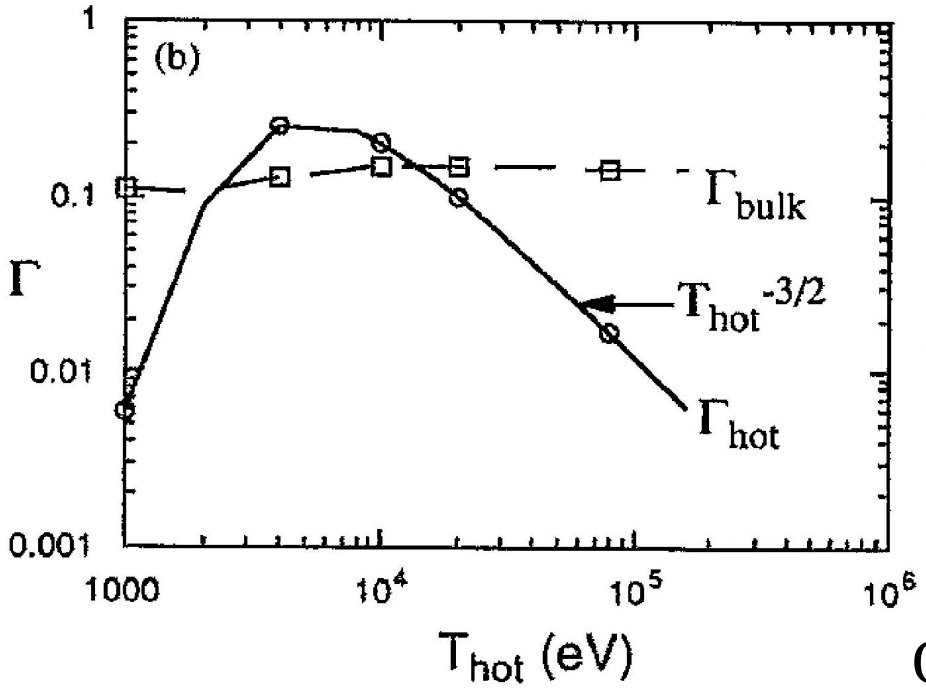


$T_e(0)$ = 1 keV
$T_D(0)$ = .51keV
$n_e = 5\times10^{13}$ cm^{-3}
B_T = .25 T
f = 41 MHz
$\omega/\Omega_D \approx 21$

Lashmore-Davies, ’98

Predictions

- Ion absorption decreases with increasing launched n_ϕ, $k_{||}$
- Increases with increasing n_e, T_i
- Decreases with increasing B_T
- Unique behavior with beam T_{hot}



$T_e(0)$ = 1 keV
$T_D(0)$ = 1 keV
$n_e = 3\times10^{13}$ cm^{-3}
B_T = .25 T
f = 41 MHz

Ono, '95

Methodology

- T_i: NPA, CHERS
- T_e: Thomson scattering
- n_e: Thomson, microwave interferometer if available
- Ion loss rates: NPA, new first orbit loss diagnostic
  - help build latter
- Ion distribution function: NPA
- Absorption and wave tracing: METS, HPRT, TORIC, AORSA